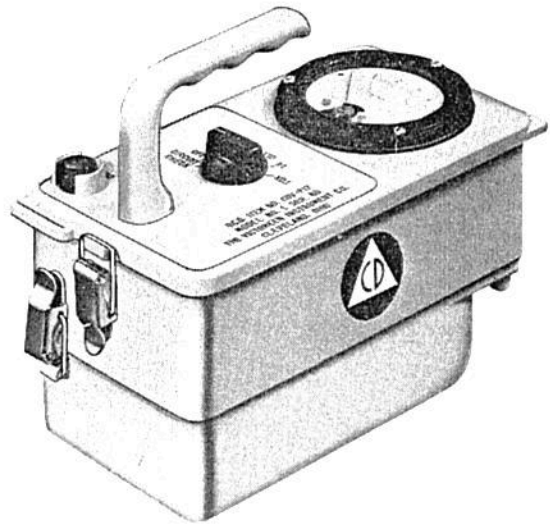


section 10

CD V-717-1



specifications:

- Ranges: 0-0.5, 0-5, 0-50, 0-500 r/hr
- Sensing Element: Ionization Chamber
- Accuracy: $\pm 20\%$ of true dose rate from
cobalt 60 or cesium 137
gamma radiation
- Battery: One 1-1/2 volt NEDA 13
- Dimensions: approx. 9-1/4" long x
4-1/2" wide x 7" high
including handle
- Weight: approx. 5-1/4 lbs. including
battery

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GENERAL DESCRIPTION

Introduction

The Victoreen CD V-717 model 1 is a portable ionization chamber instrument designed for the detection of high levels of gamma radiation. The entire instrument and its accessories include a printed circuit board, indicating meter, ionization chamber, 25-foot cable, carrying strap, strap fastener, and three case sections.

Meter and Controls

The CD V-717-1 uses a ruggedized, metal-cased meter to meet the instrument requirements for water-tightness, shock, and vibration resistance. Two controls are provided. One control is a range selector switch which turns the instrument on, checks its operation, and selects the desired sensing range. The other is a zero control which is used to adjust the instrument to assure proper reading. Zeroing compensates for temperature variations and battery aging.

Adjustments and Readings

Zero Adjust

Turn the instrument on by turning the range switch from OFF to the ZERO position. Wait about a minute to allow the electrometer tube to warm up, then orient the ZERO control until the meter indicates zero. The instrument must be zeroed before attempting to check the circuitry or use any of the sensing ranges.

Circuit Check

Turn the range switch from the ZERO position to the CIRCUIT CHECK position. The range switch must be held against the stop in this position since the switch is spring-loaded to return to OFF. The meter should read in or above the red outlined section labeled CIRCUIT CHECK. Weak or dead batteries are often the cause of inability to zero or circuit check the instrument. Refer to the Trouble Shooting Guide for corrective measures if a low reading is obtained.

The zeroing and circuit check operations may be performed at any time whether the instrument is in a radiation field or not. However, the instrument must be zeroed before making the circuit check.

Sensing Ranges

The radiation sensing ranges are activated by turning the range switch to X100, X10, X1, or X0.1. The sensing ranges can be checked only for erratic or upscale readings unless a radioactive source is available. In the absence of radiation, the meter should return to within 3 minor divisions of zero after allowing a few seconds for transient currents to dissipate.

Table 10-1 lists switch positions and the corresponding meter readings. Figure 10-1 shows the meter face. Readings should not be taken with the pointer indicating in the lower 10% of the scale. Turn to the next most sensitive range until the pointer indicates in the upper 90% of the scale.

Switch Position	R/hr
X0.1	0-0.5
X1	0-5
X10	0-50
X100	0-500

Table 10-1. Switch Positions vs Meter Readings

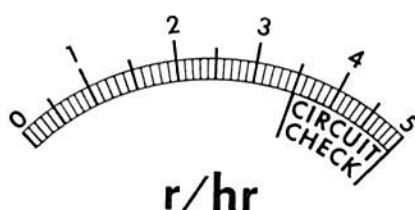


Figure 10-1. Meter Face

Remote Operation

A cable for remote monitoring of radioactivity is supplied in the detachable ion chamber compartment. The cable is provided with a spool to prevent damage.

1. Open the bottom compartment containing the cable spool and ion chamber by releasing the pull catches.
2. Remove the cable from the case and carefully unwind it from the spool by pulling it straight off the spool rather than sliding it over the sides of the spool and twisting it.
3. Connect the threaded cable plug to the ion chamber by turning the ion chamber assembly, and slide the push-fit cable plug onto the blukhead connector on the instrument case bottom. (See figure 10-2)
4. Rest the instrument on the cable spool with the cable connector extending through the slot in the spool as shown in figure 10-2. This method prevents damage from sharp bending of the cable and provides a table rest for operating the instrument.

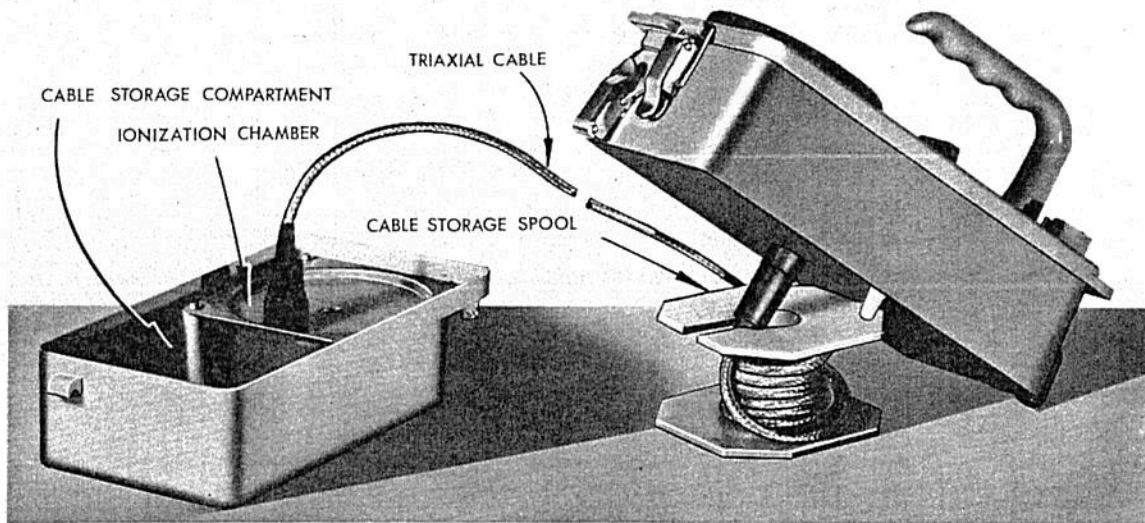


Figure 10-2. Remote Operation

5. To monitor radiation remotely, place the ion chamber case in a clear, flat area within reach of the cable. A plastic bag should cover the ion chamber case to prevent the accumulation of moisture, dirt, and contamination.
6. Response times of the instrument in remote operation are as follows:

<u>Range</u>	<u>Response Time</u>
X100	9 seconds
X10	9 seconds
X1	50 seconds
X0.1	4 minutes

7. Reassemble the instrument and cable only when they are free of moisture, dirt, and contaminants. The cable must be wound neatly for fitting the storage space next to the ion chamber. When reclosing the case sections, carefully mate the case connectors before locking the pull catches.

The cable is a miniature cable and is vulnerable to damage from excessive sharp bending or twisting. The threaded cable connector, when mated with the ion chamber, is moisture-proof. The push-fit connector at the instrument

is designed to be water resistant. Drying when necessary should be accomplished by baking at not over 150°F.

Battery

The CD V-717-1 is powered by one 1-1/2 volt "D" size flashlight cell. The battery will operate the instrument continuously for over 150 hours and much longer on an intermittent basis. Many units will operate as long as 300 hours continuously. Refer to Appendix A for acceptable types and makes of batteries.

Installation

Open the instrument by opening the pull catch at each end of the case and separating the top from the case bottom. Insert the battery in the battery compartment observing the indicated polarity. The battery compartment (see figure 10-3) is designed to be mechanically selective so that the battery cannot

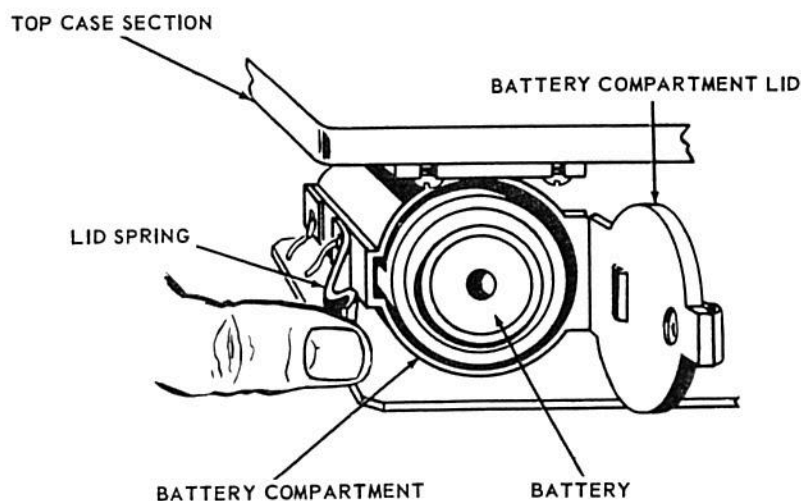
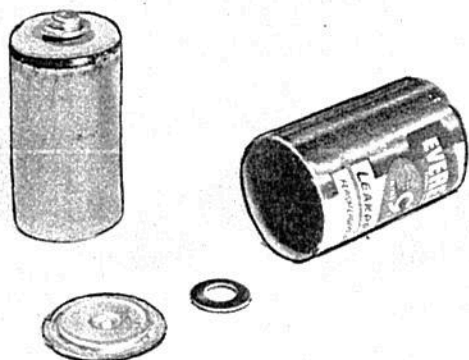


Figure 10-3. Battery Compartment

make contact with reversed polarity. Close the case by aligning the top with the case bottom and closing the pull catches.

The battery end cap can cause intermittent operation. On certain makes of batteries, the cap is held by a cardboard tube against the zinc base. If the



zinc oxidizes or the cardboard fails to hold the end cap, the battery cannot make good electrical connection with the battery compartment contacts. The remedy for both situations is to remove the outer cardboard shell and end cap as shown in figure 10-4. The exposed battery will have the same useful life.

Figure 10-4. Battery Modification

Replacement

The battery should always be checked before making further instrument repairs or adjustments. The battery may be checked with a voltmeter while installed in the instrument. With the range switch in the ZERO position, the battery should measure at least 1.25 volts under load. The battery may also be removed and checked with a battery tester.

Good batteries are required since a direct relationship exists between battery voltage and instrument response to radiation. Instruments with very weak batteries may give errors in radiation response even through satisfactory circuit check and zero adjustment may be obtained.

Electronic Circuitry

All electrical components which make up the circuitry are fastened to a printed circuit board. The circuitry serves to measure the minute current from the ionization chamber which indicates the presence of ionizing radiation. The high impedance components are housed in a light-tight enclosure for protection and shielding.

Input Circuit

The minute ionization current from the chamber collector at 0.5 R/hr — about 6 micromicroamperes — flows through a 180,000 megohm resistor and develops a voltage drop of about 1.1 volts across the resistor. This voltage is

also applied to the grid of the electrometer tube, V1, which is connected as a triode. The range switch changes high megohm resistor values to keep the voltage applied to the electrometer tube grid within the proper operating range.

Measuring Circuit

A 50 microampere meter is used to measure the change in current through the electrometer tube. The static plate current is cancelled by running a reverse current, supplied by the filament battery BT1, through the meter. The magnitude of this current is fixed by the bucking resistor R11. The zero control, R2, changes the bias on the electrometer tube. When R2 is adjusted properly, the meter reads zero. High megohm resistors R12 through R15 are input resistors for the electrometer tube on the various ranges. When the ionization chamber is exposed to radiation, a positive voltage is developed across the high megohm resistor chosen by the range switch. This voltage results in an increase in tube current, and the indicating meter reads upscale in proportion to the radiation intensity.

Resistors R10, R10A, R10B, and R10C are calibrating potentiometers which shunt some of the current around the meter on the various ranges. In the CIRCUIT CHECK position, resistor R9 serves to change the bias on the electrometer tube, making the meter read upscale.

Power Supply

Three separate d.c. voltages are required: the plate voltage supply of 10.5 volts, the grid bias supply of -3.8 volts, and the ion chamber collecting voltage of 50 volts.

All of these voltages are obtained from a transistor oscillator circuit. Transistor Q1, battery BT1 and the primary of transformer T1 constitute this oscillator. Feed-back to the base of Q1 from the upper portion of T1 through capacitor C1 serves to sustain oscillation. The three output voltages are rectified from the a.c. output of the secondary of T1 by rectifiers CR1, CR2, and CR3.

Variations in output voltage with battery voltage and load current changes are prevented by the regulating network R5 and R6. This network feeds back a portion of the plate supply voltage to the base of Q1 so as to control the bias

CD V-717-1

Victoreen

current. Thus the battery current and magnitude of oscillation are controlled in such a fashion as to keep the plate voltage constant. This method of regulation limits the battery drain through Q1 when the battery is new and hence contributes to long battery life.

SERVICING

Precautions

High Impedance Circuitry

The high megohm resistors, electrometer tube, ceramic switch wafer, ionization chamber feed-thru insulator, and bulkhead connector constitute the high impedance circuitry of the CD V-717-1. Any accumulation of dirt or grease on these parts will render the instrument inoperable. These parts must not be handled except in accordance with instructions in Section 1 of this Manual.

Semi-Conductor Components (Diodes and Transistors)

The semi-conductor components used in the instrument may be damaged by prolonged heating during soldering. When replacing any of these components, the soldering operation should be done quickly. Hold the lead between the component and the joint with a heat sink to decrease the amount of heat transmitted to the component. Techniques are described in Section 1 of this Manual.

Electrometer Tube

When checking the electrometer tube filament, use an ohmmeter which has an output current of less than 10 ma when used to measure resistances of about 100 ohms. Current in excess of 10 ma may destroy the filament. No damage will result from use of the ohmmeters described in Appendix B.

Cable

The miniature cable is vulnerable to damage from excessive sharp bending or twisting. Use care when connecting the threaded cable plug to the ionization chamber. Follow the instructions on pages 10-3 and 10-4.

Disassembly Instructions

1. Turn the instrument "OFF" and remove it from the case. On some models, a coil spring connects to the guard ring of the chamber. Remove it before working on the instrument.
2. Remove the ZERO control knob by loosening the set screws on the ends of the knob. It is not necessary to remove the range switch knob.

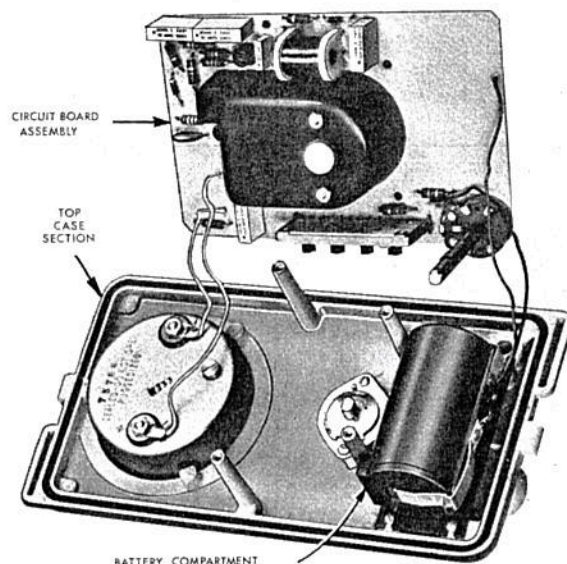


Figure 10-5. Partially Disassembled Instrument

3. Remove the four screws holding the circuit board. The ground contact spring is also held by one of these screws.
4. Remove the circuit board by pressing on the zero control shaft. Remove the range switch drive shaft from the circuit shield box without changing the position of the switch wafers inside.
5. Remove the circuit shield box by removing the two nuts on top and the screw from the back of the circuit board assembly at the sloping end of the shield box.
6. To remove the high impedance circuitry:
 - (a) Remove the two screws holding the resistor support block to the circuit board.
 - (b) Remove the nuts, lockwashers, and spacers holding the ceramic switch wafer.
 - (c) Unsolder the one bare wire connecting the high impedance circuit assembly to the circuit board.
 - (d) Unplug the electrometer tube using tweezers or needle-nosed pliers to pull all four wires straight out of the socket at one time. (See figure 10-6)

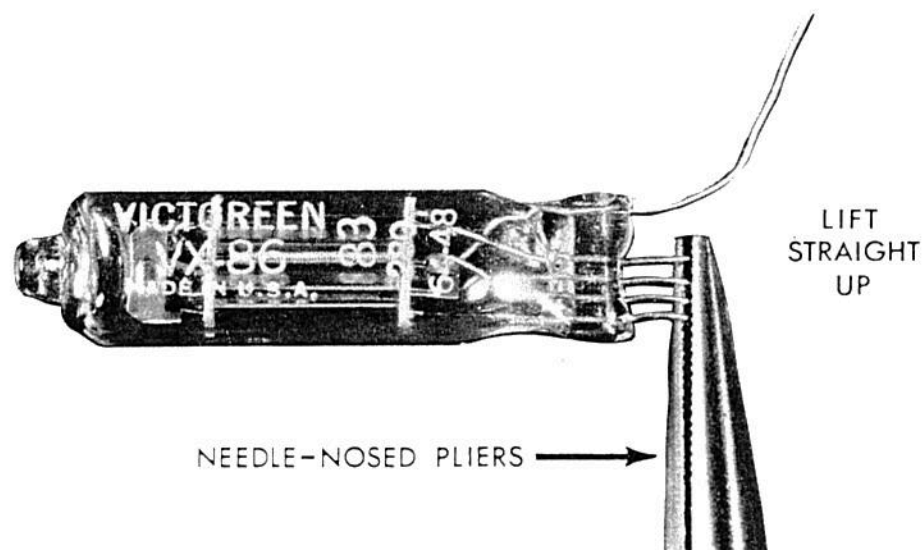


Figure 10-6. Electrometer Tube Removal

- (e) Do not handle the high impedance components with the bare hands.
 - 7. Reassemble the instrument by reversing the disassembly procedure and observing the following:
 - (a) Both rotors of the two switch wafers must be in the "OFF" position as during disassembly.
 - (b) Plug the electrometer tube back into the socket by carefully aligning the four leads with tweezers or needle-nosed pliers and pressing the leads into place. Avoid touching the tube base. Insert all of the four leads at once.
 - (c) Start all of the screws and nuts holding the high impedance components and then tighten.
 - (d) Solder the bare wire from the switch wafer to the circuit board.
- The remainder of the reassembly process is the reverse of the disassembly procedure.

Preventive Maintenance

It is recommended that preventive maintenance procedures be carried out once a month when the instrument is in use, and about once every six months when the instrument is in storage as follows:

1. Remove the battery, clean battery contacts and battery terminals if necessary, and remove any corrosion present.
2. Replace the battery making certain that the battery makes good contact and exceeds minimum voltage.
3. Perform the Zero and Circuit Check operations.

Do not use cleaning solvents on the plastic parts. Use soap and water to clean the case. If the battery has leaked, remove the case bottom and fill it with warm water. The battery spillage will be loosened in a short while and can be rinsed out. Dry the case carefully before reassembling. HUMI-SORB desiccant or its equivalent should be packed in the case bottom of the instrument upon receipt at warehouses and upon completion of servicing or periodic maintenance.

Repairs

Electrometer Tube Replacement

Follow the Disassembly Instructions through step 6. When the high impedance assembly is loose from the circuit board, the electrometer tube may be withdrawn from the Teflon insulating block by pushing on the top of the tube. Slide the new tube through the block and install the leads. Do not allow the grid lead to touch the insulating block since this can cause upscale readings or insensitivity.

Switch Replacement

Disassemble the instrument through step 6 of the Disassembly Instructions. The ceramic switch wafer is part of the removable high impedance assembly and may be replaced by unsoldering the high megohm resistors and the electrometer tube grid lead.

Use the following procedure to replace the phenolic switch wafer:

1. Disassemble the instrument through step 6 of the Disassembly Instructions.
2. There are two recommended methods for lifting the switch terminals from the circuit board. Use method (a) below if the switch wafer is to be saved. Method (b) is faster but should be used only when the wafer is known to be defective beyond repair.
 - (a) Heat each switch terminal on the circuit board, one at a time, and pry upward carefully on the switch wafer with a soldering aid. See figure 10-7. Repeat this procedure several times until all terminals are free. Do not use excessive heat or damage to the circuit board plating will result.
 - (b) Cut each switch terminal close to the top of the circuit board with diagonal cutters. Heat and remove the remaining portion of each terminal.
3. Open the holes on the circuit board with a soldering pencil and soldering aid to allow the switch terminals to be inserted.
4. Insert the new switch and solder each terminal using a minimum amount of heat.

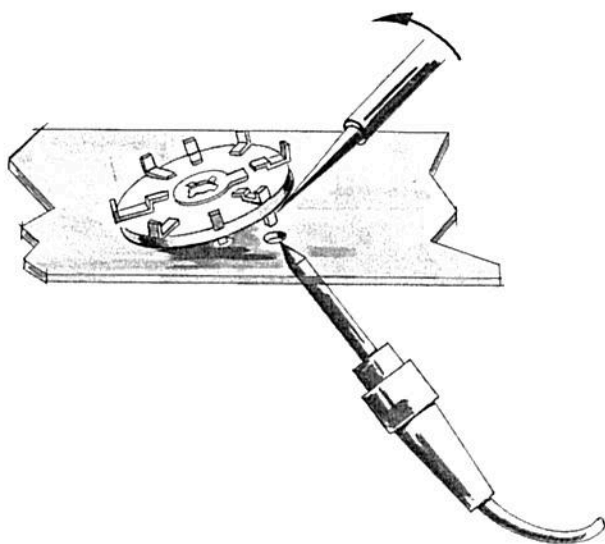


Figure 10-7.
Switch Removal

Chamber Contact Spring Repair

The brass chamber contact spring should be visible approximately $\frac{3}{4}$ " inside the hole near the front of the circuit board. The purpose of this spring is to make contact with the bulkhead feed-thru connector on the center case section. This provides the electrical connection between the electrometer tube grid and the collector of the ionization chamber. If the spring is pushed too far up into the shield box, use a soldering aid to bend it down toward the circuit board. (See figure 10-8)

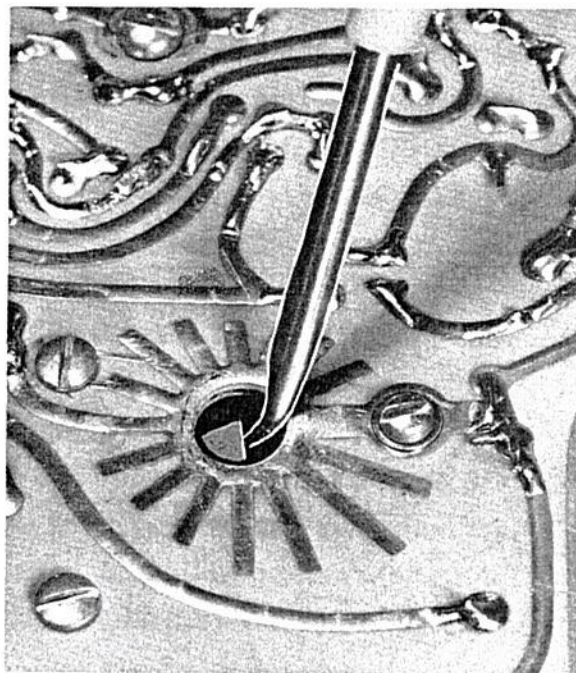


Figure 10-8. Contact
Spring Repair

Zero Potentiometer Replacement

The zero potentiometer, R2, is soldered directly to the printed circuit board. To remove, follow the disassembly instructions through step 4, then use either method (a) or method (b) below. Method (a) should be used if the potentiometer is to be saved. Method (b) is faster but destroys the potentiometer terminals.

- (a) Heat the three mounting lugs and the three terminals, one at a time, and press sideways on the potentiometer shaft. This will tend to lift the terminals from the circuit board. Repeat this procedure several times, pushing away from the solder joint each time, until the potentiometer is free.
- (b) Cut the three terminals with diagonal cutters. Heat the three mounting lugs, one at a time, and press sideways on the potentiometer shaft. This will tend to lift the lugs from the circuit board. Repeat this procedure several times, pushing away from the solder joint each time, until the potentiometer is free. Heat and remove the remaining portions of the terminals.

To install the new potentiometer, open the holes on the circuit board with a soldering pencil and soldering aid. Be sure the potentiometer is seated properly so that the shaft will fit through the hole in the case top.

Preliminary Adjustment after Replacing the Electrometer Tube or Transistor

1. Turn the instrument on, zero the meter, and check for functioning on CIRCUIT CHECK.
2. Move the range switch slowly through the sensing ranges and observe the stability of the meter indication, particularly on X0.1.
3. Using the X0.1 range, expose the chamber to radiation and observe the speed of response of the meter. Three possibilities exist:
 - (a) Meter oscillates
 - (b) Meter responds normally
 - (c) Meter responds very slowly
4. If case (a) occurs, make sure both solder bridges are removed.
(See figure 10-9)

5. If case (b) occurs, the unit may be calibrated without further adjustment.
6. If case (c) occurs, short out one or both resistors as needed to increase the speed of response to an acceptable rate. (See figure 10-9)

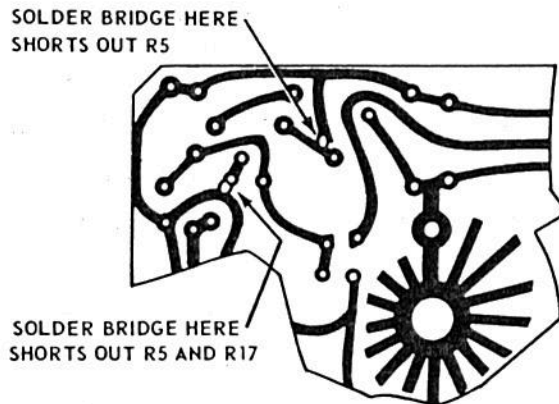


Figure 10-9. Response Adjustment

Guard Ring Contact Spring Modification

On early production units, a helical spring (part no. 12-39) was used to make contact between the bulkhead feed-thru connector and the circuit board. A modification kit has been supplied consisting of a flat spring (part no. 817-77)

and a 5/16" screw. The new contact spring, which is mounted directly to the printed circuit board, is shown in figure 10-10. To modify instruments not having the new contact spring:

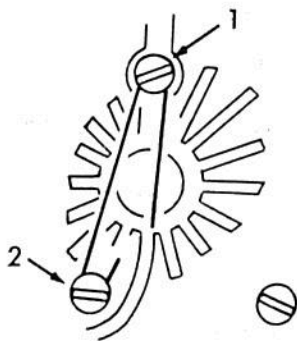


Figure 10-10
Guard Ring
Contact Spring

1. Remove and discard the screw at point 2 (figure 10-10)
2. Move the screw from point 1 to point 2. Do not tighten this screw.
3. Position the spring as shown in figure 10-10. Make sure that the portion of the spring over the hole is to the right of the center of the hole as shown.
4. Install the 5/16" screw supplied at point 1 and tighten both screws.

Trouble Shooting

The information in this section is presented as an aid to the service technician in determining the causes of specific instrument faults. The Trouble Shooting Guide lists the most probable causes of instrument failure together with suggestions for corrective action. This should be consulted and followed after the following preliminary steps have been taken:

1. Disassemble the instrument through step 1 of the Disassembly Instructions.
2. Check the battery. Make sure it provides sufficient voltage for proper operation of the instrument.
3. Check the printed circuit board for broken foil, cold solder joints, or solder bridges.
4. Check for broken components.

Table 10-2, Test Point Chart, and figure 10-11, Location of Test Points, eliminate the need for circuit tracing when making voltage and resistance measurements. The Test Points are referred to in the NOTES column of the Trouble Shooting Guide, and are also found on the schematic circuit diagram.

TROUBLE SHOOTING GUIDE



RANGE SWITCH POSITION	SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION	NOTES
ZERO	Dead	Poor connection to battery Meter defective Open contact on S1A	Repair connection Repair or replace meter Repair switch	Check continuity at A - ▲
	Downscale	Zero control improperly adjusted V1 filament open or making poor contact to socket CR1 shorted CR2 defective Q1 defective	Turn zero control fully counterclockwise, then clockwise until instrument zeroes Replace V1 or repair connection Replace CR1 Replace CR2 Replace Q1	Check resistance at A - C Lift one end of CR1 and check instrument again Check voltage at S Check Q1 for beta and shorts

RANGE SWITCH POSITION	SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION	NOTES
ZERO (cont'd)	Downscale (cont'd)	T1 defective	Repair or replace T1	Check resistances at N - R L - R K - P C - P
		C1 open	Replace C1	
		C3 shorted	Replace C3	
		C4 defective	Replace C4	
		C7 shorted	Replace C7	
	Upscale	CR3 defective	Replace CR3	Check voltage at B
		V1 defective	Replace V1	Check V1 for shorts
		T1 defective	Replace T1	
		C1 shorted	Replace C1	Voltage at S, M high
		C6 shorted	Replace C6	Voltage at B low
	Erratic	C8 shorted	Replace C8	
		R2 defective	Repair or replace R2	
		Meter defective	Repair or replace meter	
		CR2 defective	Replace CR2	
		Open contact on S1A	Repair switch	Check continuity at A - ▲
		Open contact on S1B	Repair switch	Check continuity at B - Q
		R2 defective	Repair or replace R2	

CIRCUIT CHECK	Below Red Area	Battery low or making poor contact CR1 shorted C3 open Open contact on S1C V1 transconductance low	Replace battery or repair contact Replace CR1 Replace C3 Repair switch Replace V1	Voltage at M low Check continuity at A - D
Radiation Sensing Ranges	Upscale on one or more ranges, but greatest effect on X0.1 range	Moisture contaminating high impedance components Chamber defective V1 defective	Dry out with heat (150° F or less) or desiccant Repair or replace chamber Replace V1	Remove chamber and check instrument again Check V1 for grid current
	Pegs upscale on all ranges	V1 defective	Replace V1	Check V1 for shorts
	No response to radiation on all ranges	Chamber spring not making contact to bulkhead connector Poor contact at circuit board grounding point Loss of electrical contact between case and sections	Bend chamber spring Tighten screw Inspect and repair all contacts	See figure 10-8

RANGE SWITCH POSITION	SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION	NOTES
Radiation Sensing Ranges (cont'd)	No response to radiation on all ranges (cont'd)	Poor cable connections Remote cable defective Chamber defective CR1 defective C5 shorted V1 defective	Repair cable connections Repair or replace cable Replace chamber Replace CR1 Replace C5 Replace V1	Voltage at M=0 or low
	Low response to radiation on all ranges	Chamber defective CR1 defective V1 defective	Repair or replace chamber Replace CR1 Replace V1	Voltage at M low Check V1 for transconductance
	No response to radiation on only one range	Calibration control turned fully counterclockwise High megohm resistor dirty or defective S1B defective	Recalibrate on particular range Clean or replace high megohm resistor Repair switch	Check resistances at B - Q Check resistances at B - Q
	Low response to radiation on only one range	Calibration disturbed High megohm resistor dirty or defective	Recalibrate on particular range Clean or replace high megohm resistor	Check resistances at B - Q

Erratic response to radiation	Poor connection at chamber contact spring	Bend spring	See figure 10-8
	Poor connection at circuit board grounding point	Tighten screw	
	Poor electrical contact between case and sections	Inspect and repair all contacts	
	Poor cable connections	Repair cable connections	
	Remote cable defective	Repair or replace cable	
	Dirt on ceramic switch wafer	Clean switch	
	Chamber defective	Replace chamber	
	Meter defective	Repair or replace meter	
	CR1 defective	Replace CR1	
	Q1 beta too high	Replace with transistor having proper gain	
	S1B defective	Repair switch	Check resistances at Q - B
	S1C defective	Repair switch	Check continuity at A - H A - G A - F A - E
	V1 defective	Replace V1	

RESISTANCE CHART

Remove battery before checking resistances. Values $\pm 20\%$ except as noted.

Component	Points	Range Switch Position	Resistance (ohms)
S1A	A - ▲	All except OFF	0
S1B hi-megs	B - Q	CIRCUIT CHECK ZERO X100 X10 X1 X0.1	0 0 $1.8 \times 10^8 \pm 5\%$ $1.8 \times 10^9 \pm 5\%$ $1.8 \times 10^{10} \pm 5\%$ $1.8 \times 10^{11} \pm 5\%$
S1C	A - D A - H A - G A - F A - E	CIRCUIT CHECK X100 X10 X1 X0.1	0 0 0 0 0
*V1 filament	A - C	Any	80-150
T1	C - P K - P N - R L - R	Any Any Any Any	1.4 1.4 53 675

*Remove one meter terminal before making this test.

VOLTAGE CHART

Voltages measured with respect to point ▲ with instrument correctly zeroed on ZERO range. Use a 20,000 ohms per volt meter. All values $\pm 20\%$.

Point	Voltage		Voltmeter Range	
M	50	64	250	200
S	10.5	12.3	50	200
B	-3.8	-4.3	50	20
J	1.7	1.65	2.5	2
C	1.5	1.54	2.5	2

Table 10-2. Test Point Chart

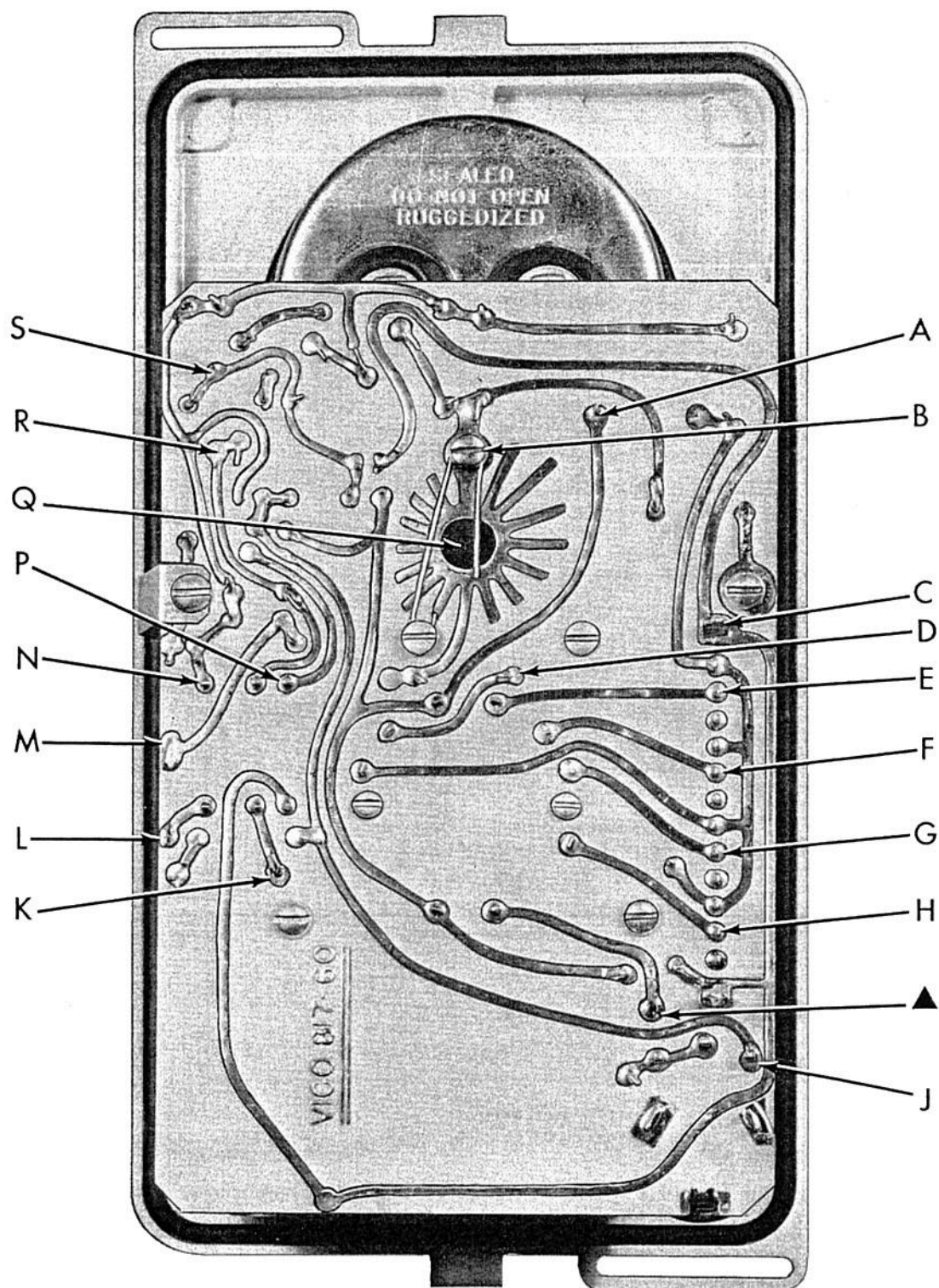


Figure 10-11. Location of Test Points



A indicates Test Points

Voltages measured with respect to point **A** with instrument correctly zeroed on ZERO range. Use a 20,000 ohms per volt meter

10-26

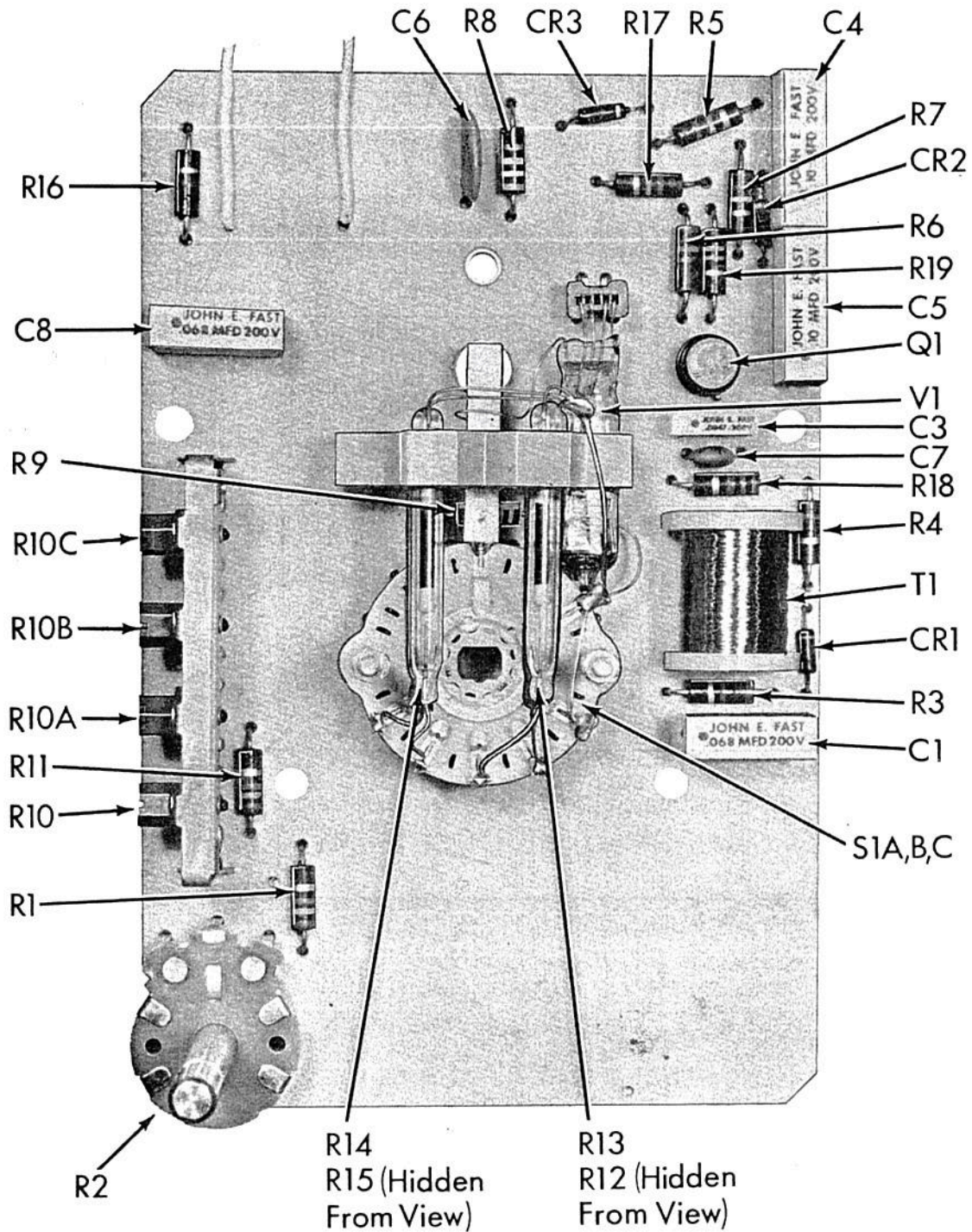


Figure 10-13. Location of Components

PARTS LIST

Electrical Components

Circuit Symbol	Description	Function	Manufacturer & Part No.	Victoreen Part No.
BT1	Battery "D" size 1-1/2V NEDA 13	D.C. power supply to oscillator and VX86 filament	Union Carbide 950	16-4
C1	Capacitor 0.068 ufd 200V	Oscillator base coupling capacitor	John E. Fast Co. F308C683-3	21-408
C3	Capacitor 0.0047 ufd 200V	Oscillator tank capacitor	John E. Fast Co. F308C472-3	21-422
C4	Capacitor 0.1 ufd 200V	VX86 plate supply filter capacitor	John E. Fast Co. F308C104-3	21-407
C5	Capacitor 0.1 ufd 200V	Chamber voltage filter capacitor	John E. Fast Co. F308C104-3	21-407
C6	Capacitor 0.01 ufd 200V	Grid bias voltage filter capacitor	Radio Materials Corp. SM-.01	21-423
C7	Capacitor 0.001 ufd 200V	Chamber voltage filter capacitor	Aerovox Corp. 500282051 0012020	21-424
C8	Capacitor 0.068 ufd 200V	Transient suppressor capacitor	John E. Fast Co. F308C683-3	21-408
CR1	Diode, silicon	Chamber voltage supply rectifier	Raytheon Mfg. Co. D59212	52-99

CD V-717-1

Victoreen

Circuit Symbol	Description	Function	Manufacturer & Part No.	Victoreen Part No.
CR2	Diode, silicon	Plate voltage supply rectifier	Raytheon Mfg. Co. D59209	52-100
CR3	Diode, silicon	Grid bias voltage rectifier	Raytheon Mfg. Co. D59209	52-100
M1	Meter 0-50 ua	Visual indication	Victoreen Instrument Co. 817-18	817-18
Q1	Transistor PNP germanium	Power supply oscillator	Raytheon Mfg. Co. T53750	23-34
R1	Resistor 6.8K 1/2W 10%	Transistor base bias resistor	International Resistance Co. GBT-1/2	185-361
R2	Potentiometer 15K 1/2W	Zero adjust	Chicago Telephone Supply Corp. WP-45 Spl.	22-168
R3	Resistor 1.5K 1/2W 10%	Transistor base current limiter	Stackpole Carbon Co. RC20	185-351
R4	Resistor 5.6 meg 1/2W 10%	Decoupling filter, chamber voltage supply	Stackpole Carbon Co. RC20	185-406
R5	Resistor 12K 1/2W 10%	Voltage divider, oscillator regulator circuit	International Resistance Co. GBT-1/2	185-368
R6	Resistor 68K 1/2W 5%	Voltage divider, oscillator regulator circuit	Allen-Bradley EB6835	185-156
R7	Resistor 220K 1/2W 10%	Series limiter, grid bias supply	Stackpole Carbon Co. RC20	185-331

Circuit Symbol	Description	Function	Manufacturer & Part No.	Victoreen Part No.
R8	Resistor 390K 1/2W 10%	Load resistor, grid bias supply	Stackpole Carbon Co. RC20	185-306
R9	Resistor 1 meg 1/2W 10%	Circuit check, shifts grid bias	Speer Resistor Co. RC20	185-1
R10 - R10A - R10B - R10C	Quadruple potentiometer 50K-50K-50K-50K	—	Centralab YAN001-27E6F	22-187
R10	Section of quad.pot. 50K	X100 calibration adjustment	—	—
R10A	Section of quad.pot. 50K	X10 calibration adjustment	—	—
R10B	Section of quad.pot. 50K	X1 calibration adjustment	—	—
R10C	Section of quad.pot. 50K	X0.1 calibration adjustment	—	—
R11	Resistor 6.8K 1/2W 5%	Zero signal bucking current	International Resistance Co. GBT-1/2	185-361
R12	Resistor 1.8×10^8 5% (red-brn)	X100 grid resistor	Victoreen Instrument Co. 185-1387	185-1387
R13	Resistor 1.8×10^9 5% (yel-brn)	X10 grid resistor	Victoreen Instrument Co. 185-1386	185-1386

Victoreen

Circuit Symbol	Description	Function	Manufacturer & Part No.	Victoreen Part No.
R14	Resistor 1.8×10^{10} 5% (grn-brn)	X1 grid resistor	Victoreen Instrument Co. 185-1385	185-1385
R15	Resistor 1.8×10^{11} 5% (blu-brn)	X0.1 grid resistor	Victoreen Instrument Co. 185-1388	185-1388
R16	Resistor 1K 1/2W 10%	Feedback resistor	International Resistance Co. GBT-1/2	185-367
R17	Resistor 12K 1/2W 10%	Step gain adjustment	International Resistance Co. GBT-1/2	185-368
R18	Resistor 22 meg 1/2W 10%	High voltage bleeder	Allen-Bradley EB2261	185-275
R19	Resistor 27K 1/2W 10%	Voltage divider	Allen-Bradley EB2731	185-395
S1A-S1C	Switch section, phenolic wafer	Battery switch and cal. resistance selector	Standard Grigsby, Inc. 28781 - 4 MLR	817-69
S1B	Switch section, ceramic wafer	High megohm resistor selector	Victoreen Instrument Co. 817-68	817-68
T1	Transformer	Power supply oscillator	Victoreen Instrument Co. 14-61	14-61
V1	Electrometer tube VX86	Ion current detector	Victoreen Instrument Co. 35-134	35-134
V2	Ionization chamber	Radiation detector	Victoreen Instrument Co. 817-40	817-40

Mechanical Components

Description	Function	Manufacturer & Part No.	Victoreen Part No.
Back contact spring	Makes contact to positive battery terminal	Victoreen Instrument Co. 817-57	817-57
Battery compartment	Holds batteries	Victoreen Instrument Co. 817-59	817-59
Bulkhead connector	Connects ion chamber to chamber contact spring	Victoreen Instrument Co. 817-53	817-53
Cable spool	Stores detector cable	Victoreen Instrument Co. 817-28	817-28
Case bottom section	Bottom of instrument case	Victoreen Instrument Co. 817-6	817-6
Case gasket	Water seal between case top and case bottom	Victoreen Instrument Co. 720-157	720-157
Case top and handle assembly	Instrument carrying handle and instrument panel	Victoreen Instrument Co. 817-44	817-44
Center case section	Circuit housing	Victoreen Instrument Co. 817-7	817-7
Chamber contact spring	Connects bulkhead con- nector to electrometer tube circuit	Victoreen Instrument Co. 815-19	815-19
Contact spring	Connects guard ring to circuit board	Victoreen Instrument Co. 817-77	817-77

Victoreen

Description	Function	Manufacturer & Part No.	Victoreen Part No.
Contact spring	Makes contact to negative battery terminal	Victoreen Instrument Co. 817-10	817-10
Detector cable assembly	Remote detector operation	Victoreen Instrument Co. 817-36	817-36
Draw pull catch (4)	Holds case sections together	Corbin Cabinet Lock Division American Hardware Corp. 15797C	700-74
Ground contact spring	Grounds circuit board to case	Victoreen Instrument Co. 817-50	817-50
Instruction manual (2)	Operating instructions	Victoreen Instrument Co. 817-1	817-1
Knob	Range switch knob	Harry Davies Molding Co. 1500-K	9-9
Knob	Zero adjust knob	Harry Davies Molding Co. 1450-AC	9-14
Lid spring	Holds battery compart- ment closed	Victoreen Instrument Co. 817-11	817-11
Meter gasket	Water seal between case top and meter	Victoreen Instrument Co. 817-73	817-73
"O" ring (2)	Zero adjust and switch shaft water seal	Cleveland Ball Bearing Co. 5427-1	46-38

Description	Function	Manufacturer & Part No.	Victoreen Part No.
Printed circuit board, processed	Supports components	Victoreen Instrument Co. 817-61	817-61
Shield box	Shields high impedance components	Victoreen Instrument Co. 817-22	817-22
Shoulder strap	Carrying strap	Victoreen Instrument Co. 700-81	700-81
Strap buckle (2)	Carrying strap length adjustment	Waterbury Buckle Co. 807-5047	710-44
Strap fastener (2)	Attaches shoulder strap	Victoreen Instrument Co. 815-47	815-47
Switch drive shaft	Connects switch index to switch wafers	Victoreen Instrument Co. 817-25	817-25
Switch index	Positions range switch	Victoreen Instrument Co. 815-36	815-36
Tube socket	Holds electrometer tube	Elco Mfg. Corp. 050788520000000	33-49

